REMARKS

Claims 1, 4, 6, 8 and 10-16 are now pending in the application. Claims 1, 4, 6, and 8 stand rejected. Claims 10-16 are withdrawn from consideration. Claims 2, 3, 5, 7, and 9 have been cancelled. Claim 1 has been amended to recite "a computer comprising a controller in communication with said differential pressure transducer." Support for the amendment is found throughout the specification and figures and at least at Paragraphs [0025] and [0038] and Figures 1A and 1B. No new matter has been added and a new search is not necessary. The Examiner is respectfully requested to reconsider and withdraw the rejections in view of the remarks contained herein.

REJECTION UNDER 35 U.S.C. § 112

Claims 1, 4, 6, and 8 stand rejected under 35 U.S.C. §112, first paragraph, as failing to comply with the enablement requirement. This rejection is respectfully traversed.

The Examiner states that "the disclosure does not enable one of ordinary skill in the fuel cell art to make and use a fuel cell with executable logic for determining a differential pressure fluctuation parameter...." Office Action at p. 7. The Examiner goes on to state that Applicants have not disclosed "the algorithm noted in arguments, what logic is required, how to write such logic, what parameter is determined or what statistics are applied to obtain this value." Office Action at p. 7. Applicants respectfully disagree with the Examiner's assertions for several reasons.

First, one of ordinary skill in the fuel cell art would know how to implement a computer having controller logic as claimed by Applicants. The Fuel Cell Technology Handbook, Chapter 10 "Automotive Applications" states:

> The mechanical, process, and electrical power systems are coordinated and controlled through an integrated system with modules for fuel, air, cooling, propulsion, indicators, and operating modes (start, warm-up, run, and shutdown). The control system takes information from internal instrumentation and provides outputs to a variety of devices, such as motor controllers, valves, and indicators. The on-board computer uses an industry standard programmable logic controller.

Fuel Cell Technology Handbook, Gregor Hoogers, ed. at 10-24 (2003).

Applicants respectfully point out that independent claim 1 has been amended to recite a computer including a controller. As stated in the Fuel Cell Technology Handbook, on-board computers and controllers are "industry standard" and thus are known to one of skill in the art. Applicants have claimed a novel aspect of those "industry standard" computers and controllers.

Second, the Examiner's concern that the apparatus claim must be structurally distinguishable from the prior art under MPEP 2114 is now moot. The Federal Circuit noted that a sufficient structure may be provided when Applicants provide "all information necessary to perform the function, except for basic mathematical techniques that would be known to any person skilled in the pertinent art." *Aristocrat Tech. Australia PTY Ltd. V. Int'l Game Tech.*, 86 USPQ2d 1235, 1242 (Fed. Cir. 2008). Applicants' fuel cell includes a computer including a controller which controls the fuel cell using logic based on pressure fluctuations calculated using a root-mean-square value. The "basic mathematical technique" of calculating a root-mean-square is a

simple statistical calculation well-known to one of skill in the art. Applicants disclose that the controller logic captures the differential pressure measurement signals and executes a Fast-Fourier-Transform on the data. Paragraphs [0044]-[0046]. The computer is distinguishable, and therefore Applicants' claimed apparatus is different.

Third, Applicants' algorithm relates to a pressure fluctuation based on a root-mean-square, which is a well-known mathematical expression within the skill set of one of ordinary skill in the art. See, *Electronics Engineers' Handbook, 3rd Edition*, Donald G. Fink, et al. at 3-20 (1989). One skilled in the art would be readily able to take Applicants' teachings and provide the fuel cell having the computer with the controller to implement the root mean square value for operation of the fuel cell.

Accordingly, Applicants have enabled the computer and executable logic for one of ordinary skill in the art. Reconsideration of the claims and removal of the §112 rejection are respectfully requested.

REJECTION UNDER 35 U.S.C. §§ 102/103

Claims 1, 4, 6, and 8 stand rejected under 35 U.S.C. §102(b) as being anticipated by OR, in the alternative, under 35 U.S.C. §103(a) as being unpatentable over DiPierno Bosco et al. (U.S. Patent No. 6,103,409) This rejection is respectfully traversed.

DiPierno Bosco et al. disclose a flooding detector and a system controller that compares the pressure drop measured on the anode and cathode during fuel cell operation and the pressure drop as measured in the unflooded "reference stack." Column 4, line 62 through column 5, line 37 and Figure 3. The DiPierno Bosco et al.

approach requires that one measure *a priori* all anode and cathode pressure drops at every combination of flow and electrical load condition expected to be encountered during fuel cell operation. The DiPierno Bosco et al. system controller does not include executable logic for determining a differential pressure fluctuation parameter as a representative statistical value from said set of differential pressure signals and accordingly the varied output actions of the fuel cell as claimed by Applicants.

In contrast, Applicants' claimed invention relates to a fuel cell stack having a computer including a controller generating a set of differential pressure signals and determining the differential pressure fluctuation parameter or the root-mean-square of the pressure fluctuation. The differential fluctuation parameter is different from the DiPierno Bosco et al. parameter because Applicants' parameter is based on the statistical value determined from the executable logic. The statistical value from the executable logic allows for circuitry control and output based on the root-mean-square of the set, the variance, or the standard deviation, as non-limiting examples. Paragraph [0045].

Applicants respectfully point out that the Federal Circuit stated that "a general purpose computer programmed to carry out a particular algorithm creates a 'new machine' because a general purpose computer 'in effect becomes a special purpose computer once it is programmed to perform particular functions pursuant to instructions from program software.'" *Aristocrat Tech.,* 86 USPQ2d at 1238 (internal cites omitted). Applicants have provided a "new machine" with the real-time computer 164 and controller logic 166 to "carry out a particular algorithm" based on the root-mean-square and differential fluctuation parameter. *See Id.* at p. 1238. The claims have been

amended to positively recite the computer. As the computer and control circuitry acts differently based on the unique differential fluctuation parameter based on the statistical value from the executable logic, Applicants' fuel cell is a different machine and is structurally distinguishable from the prior art.

Applicants' claimed invention incorporating the differential fluctuation measurements is a significant improvement over DiPierno Bosco et al. in that no prior knowledge of unflooded stack pressure drop is required because Applicants' detection method considers only fluctuations about the mean pressure drop reading. Applicants' claimed invention provides sensitivity and speed of measurement which is not disclosed, taught by, or inherent in the DiPierno Bosco et al. system which is limited to measurements based on the reference fuel cell.

Applicants' unexpectedly improved speed and sensitivity is illustrated in that the pressure drop indication based on the differential fluctuations provides a reasonable steady-state condition after an elapsed time of only 100 seconds. Applicants respectfully disagree with the Examiner's assertion that the results of the root-mean-square values used by the controller and computer are not shown in Figures 4 and 6. The pressure drop and the time are compared and graphed in the Figures 4 and 6.

Additionally, Applicants' invention facilitates sampling at 10 Hz or greater which is much more amenable to automotive fuel cell operation where the dynamic load following operation rarely allows for greater than several minutes at a fixed load condition. Paragraph [0044]. Further, Applicants achieve a relatively steady state after 100 seconds. Figures 4 and 6. To the contrary, the DiPierno Bosco et al. pressure drop indication attains a reasonable stead-state condition after an elapsed time of 1000

seconds. Figure 4 of DiPierno Bosco et al. Applicants' claimed invention provides a 10-fold increase in speed and in sensitivity. Applicants assert that the unexpected results provide a secondary consideration evidencing patentability which Applicants assert weigh in favor of patentability and non-obviousness. See *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966); *In re Sullivan,* 84 USPQ2d 1034 (Fed. Cir. 2007).

Additionally, Applicants' claimed fuel cell provides "an accurate determination of the onset of flooding status and control", "optimization of stoichiometry with a comparable optimization of air compressor capacity, efficient management of rapid power transits, and data for effective management of stack purge." Paragraph [0054].

As DiPierno Bosco et al. do not disclose, teach, or suggest Applicants' claimed invention as amended, reconsideration of the claims and removal of these rejections are respectfully requested.

CONCLUSION

It is believed that all of the stated grounds of rejection have been properly traversed, accommodated, or rendered moot. Applicants therefore respectfully request that the Examiner reconsider and withdraw all presently outstanding rejections. It is believed that a full and complete response has been made to the outstanding Office Action and the present application is in condition for allowance. Thus, prompt and favorable consideration of this amendment is respectfully requested. If the Examiner believes that personal communication will expedite prosecution of this application, the Examiner is invited to telephone the undersigned at (248) 641-1600.

Respectfully submitted,

Dated: September 24, 2008 By: _____

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